

28.0 SOUTH-CENTRAL CALIFORNIA COAST STEELHEAD ESU

28.1 BACKGROUND

28.1.1 Description of the ESU

The South-Central California Steelhead (SCCS) evolutionarily significant unit (ESU) includes all naturally spawned populations of steelhead (and their progeny) in the area extending from the Pajaro River basin in Monterey Bay south to, but not including, the Santa Maria River basin near the town of Santa Maria (BRT 2003). In the Coast Range Mountains just north of Morro Bay, there is a land-locked population of wild steelhead in the 40,662-acre-foot Whale Rock Reservoir, which was created by the construction of Whale Rock Dam across Old and Cottontail creeks near the town of Cayucos, California (SSHAG 2003). The Whale Rock Hatchery steelhead program was developed for a recreational fishery in the reservoir and collects its broodstock from the reservoir population. The hatchery program is part of the ESU.

28.1.2 Status of the ESU

The SCCS ESU was listed as a threatened species on August 18, 1997 (62 FR 43937), based on the depressed status of known stocks, poor land-use practices, trout stocking, uncertainty about historical and current steelhead run sizes, and high numbers of resident *O. mykiss* (BRT 2003). Limiting factors affecting ESU populations include impassable habitat barriers, habitat degradation, dewatering from irrigation and urban water diversions, impacts from trout transfers and recreational fishing, and drought cycles (BRT 2003). The SCCS ESU comprised 17,750 adults in the mid-1960s (CDFG 1965). It is estimated that populations in the Pajaro, Salinas, Carmel, Little Sur and Big Sur rivers have experienced a decline to less than 10% of their historical numbers (BRT 2003). Much of the available data is uncertain, and analysis of ESU status is dependent upon recent Carmel River counts at San Clemente Dam (BRT 2003). Despite a downward trend, ESU abundance has sharply increased since 1997 from fish immigration, rescue efforts and *O. mykiss* response to implemented habitat restoration improvements in the basin (BRT 2003). Recent surveys have determined steelhead presence in 86 to 94% of historical steelhead watersheds and in three other basins with no historical record of steelhead occurrence (BRT 2003). Several reservoir populations of steelhead may be impacted from effects of hatchery fish plants and recreational fishing. The West Coast Biological Review Team (BRT) members cast 68% of their votes in the “likely to become endangered” category and 25% of the votes in the “in danger of extinction” category. The BRT expressed its strongest concern for spatial structure, but ESU abundance and productivity were also considered at great risk.

28.2 ASSESSMENT OF THE HATCHERY PROGRAM

The Whale Rock Hatchery steelhead program is managed to provide enhancement fish for a trophy fishery in Whale Rock Reservoir (BRT 2003). The program was initiated by the Whale Rock Commission, in cooperation with the California Department of Fish and Game (CDFG), and funded by Federal excise taxes authorized by the Sport Fish Restoration Act. There is a year-round fishery in Whale Rock Reservoir, with a daily bag limit of five *O. mykiss* (CDFG 2004).

The Whale Rock Hatchery stock is part of the SCCS ESU. The following section presents a summary of the program history, similarity between hatchery-origin and natural-origin fish, program design, and program performance of the artificial propagation program (Table 28.1).

Table 28.1. Artificial Propagation Program which releases steelhead within the geographical area of the South Central California Steelhead ESU.

Program	Type	Included in ESU	Description	Production Level	Year Initiated
Whale Rock Hatchery	integrated	yes	fingerling	variable	1961

28.2.1 Whale Rock Hatchery Steelhead Program

28.2.1.1 Program History

Whale Rock Dam was designed and constructed by the State Department of Water Resources in 1961 to provide water to the City of San Luis Obispo, California Polytechnic State University, and California Men's Colony. The Whale Rock Dam captures water from a 20.6-square-mile watershed and has a storage capacity of over 40,000 acre-feet and a maximum surface area of 600 acres. Water is delivered through 17.6 miles of 30-inch pipeline and two pumping stations. The construction of the dam trapped a component of the wild steelhead run in Old Creek that continues to express anadromous migration behavior by swimming into upstream tributaries to spawn. The Whale Rock Hatchery steelhead enhancement program was established in 1992 to improve the sport fishery in Whale Rock Reservoir. Adult trout are captured near the mouth of Old Creek during late winter and spring as they begin their upstream spawning migration.

The program was founded with fish trapped at a temporary weir placed at the mouth of Old Creek Cove (Nielsen *et al.* 1997). All broodstock is collected by the Merwyn trap, which is set in the shallows of the reservoir during late winter and spring as the fish begin their migration upstream from the reservoir into Old Creek. The first five years of operations spawned an average of 47 female steelhead. This number was increased to 129 female spawners in 2002. Collected fish are spawned by hand-stripping or air injection. Spawned steelhead are returned to the reservoir after a period of recovery (SSHAG 2003).

28.2.1.2 Similarity between Hatchery-origin and Natural-origin Fish

It is not known what percentage of fish in the Whale Rock Reservoir is the result of artificial propagation or progeny of hatchery-origin fish. Hatchery production is not marked and cannot be distinguished from non-hatchery-origin fish. There is limited anadromous steelhead presence below Whale Rock Dam due to the lack of flow releases. Little opportunity has existed for gene flow between anadromous and reservoir fish stocks since completion of the dam in 1961, but there may be genetic contribution to the anadromous population from reservoir fish that spill over Whale Rock Dam during winter and spring flooding events. Nielsen *et al.* (1997) found significant genetic identity remaining in the SCCS *O. mykiss* ESU, including the Whale Rock Hatchery stock. However, of all the sampled *O. mykiss*, microsatellite allelic and haplotype

diversities were lowest in the Whale Rock Hatchery fish, indicating a reduced diversity within the hatchery stock and reservoir population (SSHAG 2003).

28.2.1.3 Program Design

The Whale Rock Hatchery steelhead program was designed to increase angling success in Whale Rock Reservoir (SSHAG 2003). Steelhead are artificially spawned at the trap site and later returned to the reservoir. Originally, fish were incubated and reared at the Whale Rock Reservoir maintenance facility, but they are now cultured at the Fillmore Hatchery in Ventura County. Fish are artificially reared until September, October, or November, when they are released as fingerlings (7.5 to 12.5 cm). Fish were formerly given an identifying mark prior to their release for monitoring their growth and survival in Whale Rock Reservoir, but that practice has since been discontinued (SSHAG 2003). The program has carried out artificial propagation intermittently since 1992.

28.2.1.4 Program Performance

The program began as a cooperative hatchery operation and is continuing under CDFG management. Program steelhead were most recently spawned in 1992, 1994, 2000, and 2002. Spawning success has been poor, and there has been no analysis of effects of hatchery enhancement of the reservoir population (SSHAG 2003). Anglers fishing the reservoir reported catches from 1995 that included some of the 13,000 adipose fin-clipped fingerlings released the previous year, and each measured 10-12 inches in length. The percentage of catch rates has improved from 9 to 41% during years 1981 through 1990 (WRP 1994).

28.2.1.5 VSP Effects

Abundance – The hatchery program does not benefit the natural steelhead population below Whale Rock Reservoir. The purpose of the program is stock enhancement for a recreational fishery within the reservoir. Hatchery fish do not contribute fish numbers to the anadromous population. There are no population estimates for the reservoir, but based on increased fishing opportunity, steelhead numbers have increased.

Productivity – It is not known if the hatchery program has contributed to natural productivity in the reservoir or if productivity of hatchery progeny is comparable to natural productivity. Effects of the program on productivity may be slowed because of the infrequency of artificial propagation. Program effects on anadromous productivity below Whale Rock Reservoir are unknown, as there is no direct hatchery contribution to the steelhead program below the dam.

Spatial Structure – The Whale Rock Reservoir steelhead program has not contributed to the spatial structure of the anadromous steelhead population. The construction of Whale Rock Dam has reduced the natural range of the anadromous population by 95%, though the reservoir population retains access to spawning habitat.

Diversity – Gene flow does not occur between anadromous steelhead below Whale Rock Dam and the reservoir-locked fish, and this affects the population dynamics and evolutionary potential

of both anadromous and resident forms of *O. mykiss* (BRT 2003). Analysis of the Whale Rock Hatchery stock confirms a reduction in genetic diversity, although the stock still retains linkage with the local steelhead in Santa Ynez and Malibu creeks (Nielsen *et al.* 1997)

28.3 CONCLUSIONS

Existing Status: Threatened
BRT Finding: Threatened
Recommendation: Threatened

28.3.1. ESU Overview

28.3.1.1 History of Populations

Populations have drastically declined from their historical abundance but have maintained a presence in the majority of their historical watersheds. Several populations have become land-locked through dam construction and no longer interact with anadromous forms of *O. mykiss*, although they exhibit migration behavior in upstream tributaries (BRT 2003). There has been a positive response to restoration actions in the Carmel River steelhead population, but several basins remain degraded, and steelhead runs continue to be reduced in size. Anadromous populations below natural reservoirs are of uncertain ESU origin (BRT 2003).

28.3.1.2 Association between Natural Populations and Artificial Propagation

Natural populations “with minimal genetic contribution from hatchery fish” – Nielsen *et al.* (1997) found reduced diversity in the Whale Rock Hatchery stock subsequent to its isolation within the reservoir. There may be some gene flow into the anadromous population from reservoir steelhead that spill over the reservoir during high flow events.

Natural¹ populations “that are stable or increasing, are spawning in the wild, and have adequate spawning and rearing habitat”² – Based on an index of abundance, the Parajo, Salinas, Carmel, Little Sur and Big Sur steelhead populations have declined to less than 10% of their historical abundance. Time-series data indicate that the steelhead population in the Carmel River has experienced a sharp increase in abundance over the past six years that is thought to be in response to habitat restoration actions.

Mixed (Integrated Programs)³ – The Whale Rock Hatchery program is an integrated program. Hatchery fish are not marked, but the small number of collected fish and infrequency of artificial

¹ See HLP for definition of natural, mixed and hatchery populations

² HLP Point 3

³ Integrated programs follow practices designed to promote and protect genetic diversity and only use fish from the same local population for broodstock (both natural-origin fish, whenever possible, and hatchery-origin fish derived from the same local population and included in the ESU). Programs operated to protect genetic diversity in the absence of natural-origin fish (e.g., captive broodstock programs and the reintroduction of fish into vacant habitat) are considered “integrated.”

propagation for the program favor the chance that non-hatchery fish are incorporated into the broodstock.

Hatchery (Isolated⁴) – None.

28.3.2. Summary of ESU Viability

28.3.2.1 Abundance

Surveys conducted by the Monterey Peninsula Water Management District (MPWMD) have shown significant increases in the numbers of juvenile steelhead residing in the Carmel River. MPWMD has also recorded sharp increases in steelhead adult numbers since 1991. ESU abundance is affected to an unknown extent by angler-caused hooking mortality (BRT 2003).

28.3.2.2 Productivity

Previous analysis indicates depressed productivity throughout the ESU with declines in population sizes. However, population persistence within much of the ESU's historical range indicates regional extirpations have not yet occurred (BRT 2003).

28.3.2.3 Spatial Structure

Recent surveys in the ESU have focused on presence/absence data and have established steelhead presence in the majority of known steelhead watersheds and in three other basins they were not previously known to inhabit.

28.3.2.4 Diversity

Diversity has not been affected to an appreciable extent, as indicated by the widely distributed presence of steelhead throughout the ESU's range. Genetic analysis of the southern coastal distribution of steelhead supports distinction from the northern and southernmost coastal steelhead stocks, although Nielsen *et al.* (1997) found loss of genetic diversity within the Whale Rock Hatchery stock.

28.3.3 Artificial Propagation Record

28.3.3.1 Experience with Integrated Programs

The Whale Rock Hatchery broodstock is collected from the Whale Rock Reservoir population. Although hatchery fish are not marked and cannot be visually distinguished from non-hatchery fish, it is highly likely that the hatchery program incorporates natural steelhead into the broodstock.

⁴ Isolated programs do not follow practices designed to promote or protect genetic diversity. Fish that are reproductively isolated are more likely to diverge genetically from natural populations included in the ESU and to be excluded themselves from the ESU.

28.3.3.2 Data on Whether Integrated Programs Are Self-sustaining

A goal of the hatchery program is to increase the reservoir population and thereby increase catch rates in the fishery (WRP 1994). As natural fish production is limited by available spawning habitat, the program is not self-sustaining at a greater than natural production level and must continue to be supplemented.

28.3.3.3 Certainty that Integrated Programs Will Continue to Operate

The operational history of the Whale Rock Hatchery has been intermittent and dependent upon a number of constraints. Program continuation and management will be affected by the ESU status of the hatchery stock and its potential use in restoration actions.

28.3.4 Summary of Overall Extinction Risk Faced by the ESU

The persistence of extant populations and retention of most of ESU spatial structure indicate that there may be fewer biological impediments to ESU recovery, though ESU abundance is greatly reduced from estimated historical numbers. Population response to habitat improvements in the Carmel River indicates that efforts towards restoration of habitat are of significant importance in recovering steelhead in the ESU.

28.4 LITERATURE CITED

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